

REMARKS/ARGUMENTS

Re-examination and favorable reconsideration in light of the above amendments and the following comments are respectfully requested.

Claims 1 - 24 are pending in the application. Currently, all claims stand rejected.

By the present amendment, claims 1 - 24 have been amended.

In the office action dated July 22, 2004, claims 1 - 3, 5 - 8, 12, 18 - 21 and 23 were rejected under 35 U.S.C. 102(b) as being anticipated by Lukco et al.; claims 4 and 11 were rejected under 35 U.S.C. 103(a) as being unpatentable over Lukco et al. in view of Strangman; claims 9 and 10 were rejected under 35 U.S.C. 103(a) as being unpatentable over Lukco et al. in view of Galmiche et al. or Terentieva et al.; claims 13 -17 were rejected under 35 U.S.C. 103(a) as being unpatentable over Lukco et al. in view of Wang et al.; claim 22 was rejected under 35 U.S.C. 103(a) as being unpatentable over Lukco et al. in view of Bhatti; and claim 24 was rejected under 35 U.S.C. 103(a) as being unpatentable over Lukco et al. in view of Rigney et al.

The foregoing rejections are traversed by the present response.

The present invention relates to a casting system which includes a refractory metal core. The refractory metal core has a means for providing oxidation resistance during shell fire and protection against reaction/dissolution during casting. The oxidation resistance and protection providing means is formed by a coating. In a first embodiment, the coating broadly comprises at least one oxide and/or a silicon containing material. In a second embodiment, the coating comprises an oxide selected from the group consisting of calcia, magnesia, alumina, zirconia,

chromia, yttria, silica, hafnia, and mixtures thereof. In a third embodiment, the coating comprises a nitride selected from the group consisting of silicon nitride, sialon, titanium nitride, and mixtures thereof. In a fourth embodiment, the coating comprises a carbide selected from the group consisting of silicon carbide, titanium carbide, tantalum carbide, and mixtures thereof. In a fifth embodiment, the coating comprises a ceramic coating and at least one layer between the refractory metal forming the refractory metal core and the ceramic coating. In a sixth embodiment, the coating comprises alumina which has been chemically vapor deposited. In a seventh embodiment, the refractory metal core has a top coat overlaying the oxidation resistance and protection means. In an eighth embodiment, the coating comprises alternating layers of alumina and a material selected from the group consisting of TiCN and zirconia.

It is submitted that none of the cited and applied references teach or suggests any of these embodiments.

The Lukco et al. reference relied upon by the Examiner relates to a hybrid reinforcement material comprising a refractory metal core having a first coating comprising an $Al_xO_yN_z$ material and a second SiC coating. The purpose of the Al-O-N material layer is to inhibit the diffusion of Si and C into the refractory core material. The hybrid reinforcement may be fabricated into various shapes or may be woven or otherwise structured prior to combination with a matrix material. As pointed out in column 4, line 35 et seq., the hybrid reinforcement material of Lukco is disposed into the matrix materials.

Claims 1, 8, 12, 18, and 19 as amended herein call for a casting system having a refractory metal core with means for providing oxidation resistance during shell fire and protection

against reaction/dissolution during casting. Lukco et al. does not teach or suggest such a casting system. Claim 8 is further allowable because Lukco et al. does not teach or suggest forming a coating having an oxide selected from the group consisting of calcia, magnesia, alumina, zirconia, chromia, yttria, silica, hafnia, and mixtures thereof. The first coating in Lukco et al. is an Al-O-N coating. Claim 18 is allowable because Lukco et al. does not teach or suggest forming a coating from alumina. The materials in Table I are potential matrix materials, not coating materials. Further, there is nothing in Lukco et al. which would lead one to select alumina from the list of potential candidates as a coating material. Clearly, this is something that Lukco et al. teaches away from.

Claim 2 is allowable over Lukco et al. because Lukco et al. does not teach forming the claimed coating from alumina silicate. As noted above, Table I lists potential matrix materials, not coating materials. Lukco et al. is very clear that the first coating is a Al-O-N coating and the second coating is SiC.

Claim 3 is allowable because Lukco et al. does not teach or suggest using a silicide layer as a portion of the coating. Again, the silicides in Lukco et al. are only mentioned in the context of potential matrix materials.

Claim 5 is allowable because Lukco et al. does not teach or suggest forming the coating from alumina.

Claims 20, 21, and 23 are allowable because Lukco et al. fails to teach or suggest forming a top coat from the claimed materials.

With regard to the rejection of claims 4 and 11, the rejection fails because Strangman does not cure the principal deficiencies of Lukco et al. Strangman relates to a thermal

barrier coating for use on turbine engine components which have already been cast. Strangman et al. does not relate in any way to a casting system having a refractory metal core. With regard to the substitution of zirconium silicate and silicon nitride, Lukco et al. teaches away from any such substitution. The whole point of Lukco et al. is to have the SiC coating and a barrier layer formed from Al-O-N to prevent diffusion of the Si and C. One of ordinary skill in the art would not be motivated to combine the references as suggested by the examiner because the coating in Lukco et al. is not a thermal barrier coating of the type used on turbine engine components.

With regard to the rejection of claims 9 and 10, these claims are allowable for the same reasons that claim 8 is allowable. The Galmiche et al. and Terentieva et al. references do not cure the principal deficiencies of Lukco et al. With regard to claim 9, there is absolutely no reason to form a coating from chromia. This is clearly something which Lukco et al. teaches away from doing. Similarly, with regard to claim 10, there is absolutely no reason to form a coating from silica. This is also something which Lukco et al. teaches away from. Further, there is no evidence that any of the coatings in the secondary references would provide any improvements. The Examiner has offered no explanation as to why this would occur.

Claims 13 - 17 are allowable because Wang et al. does not cure the principal deficiencies of Lukco et al. Wang et al. is not directed to a casting system. As for the inclusion of an intermediate layer, Lukco et al. would not want such a layer. The whole purpose of the Al-O-N layer is to prevent diffusion of the Si and C from the SiC layer into the refractory metal core. For this reason, Lukco et al. would not want an intermediate layer. If Lukco et al. were to put a layer containing silicon

adjacent the core, the silicon would diffuse into the core. Thus, one of ordinary skill in the art would not be motivated to combine Wang with Lukco et al. in the manner suggested by the Examiner.

Claim 22 is allowable because Bhatti et al. does not cure the aforementioned deficiencies of Lukco et al. Further, with regard to forming a platinum top coat on Lukco et al.'s reinforcement, there is no reason to do so. The top coat would serve no purpose since the reinforcement is to be incorporated into a matrix material.

Claim 24 is allowable because Rigney et al. does not cure the principal deficiencies of Lukco et al. Rigney et al. is not directed to a casting system having a refractory metal core. As for forming the claimed alternating layers, Lukco et al. would have no interest in that or need alternating layers. Lukco et al. can achieve the goal of providing a barrier against diffusion of Si and C into the refractory metal core with a single layer. Further, Lukco et al. specifically teaches away from forming the coating from alumina and a material selected from the group consisting of TiCN and zirconia. Further, the Examiner has not offered any statement as to how the incorporation of alumina and zirconia into Lukco et al. would keep with the aims of Lukco et al. and how it would effectively increase the wear and impact resistance of the coating - things which Lukco et al. do not appear to be interested in. Again, it should be remembered that Lukco et al. is directed to a particular reinforcement to be incorporated into a matrix material.

For the foregoing reasons, the instant application is believed to be in condition for allowance. Such allowance is respectfully solicited.

Appl. No. 10/685,631
Amdt. dated Oct. 22, 2004
Reply to office action of July 22, 2004

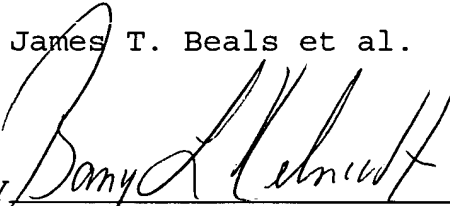
Should the Examiner believe an additional amendment is needed to place the case in condition for allowance, the Examiner is hereby invited to contact Applicants' attorney at the telephone number listed below.

No fee is believed to be due as a result of this response. Should the Commissioner determine that a fee is due, he is hereby authorized to charge said fee to Deposit Account No. 21-0279.

Respectfully submitted,

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I, Nicole Motzer, hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: "Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313" on **October 22, 2004**.

